

Compact, Controlled Force Crew Exercise System, Phase I

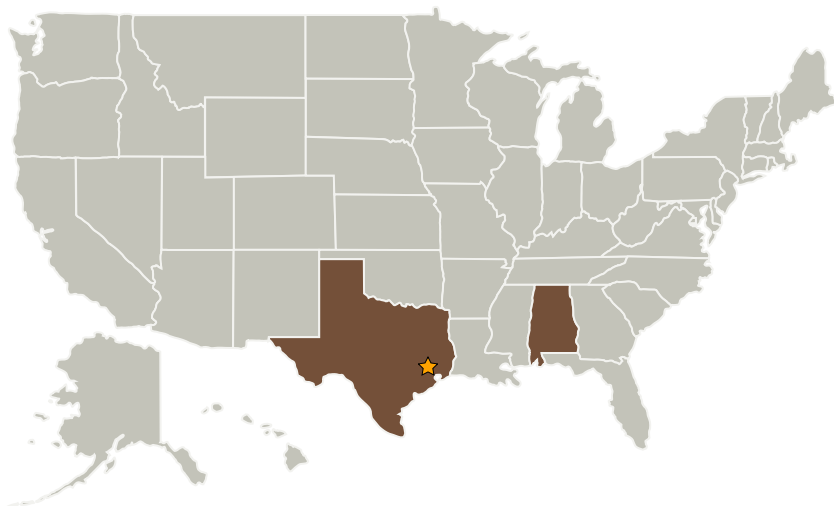
Completed Technology Project (2009 - 2009)



Project Introduction

Spaceflight adaptations include muscle atrophy, decreased bone mineral density and reduced aerobic capacity making effective resistance exercise countermeasure hardware necessary for safe and successful space exploration. Real-time control is applied to an electric servo-motor to provide resistance and aerobic exercise in a lightweight, compact, and reconfigurable design with self-contained power generation. The technical objectives of the system design are that it be easily configured and stowed, and require minimal power to operate including a pedal generator to supply electricity. The hardware is instrumented to document exercise sessions and provide whole body axial loading and individual joint resistive loading that simulates free weights with eccentric overloading. The loads are adjustable in 2.5 kg increments to maintain muscle strength and bone density, and aerobic exercise is provided with pedal attachments. The Phase 1 work plan includes initial prototype design, fabrication, and demonstration. The portable design can provide resistance and aerobic exercise in virtually any aspect of spaceflight (extended use on ISS, short-term lunar sortie missions, and future Mars exploration). The system also has application for in-home neuromuscular rehabilitation and controlled resistance exercise.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Streamline Automation, LLC	Supporting Organization	Industry	Huntsville, Alabama

Primary U.S. Work Locations

Alabama	Texas
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.3 Human Health and Performance
 - └ TX06.3.6 Long Duration Health